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MORNING AWAKENING AND EVEN-SONG.¹

BY HORACE W. WRIGHT.

AT my summer home at Jefferson Highland in the White Mountains, New Hampshire, I have been interested in obtaining, as nearly as careful and systematic effort would enable me to do, the order and manner in which the summer-resident birds within range of hearing awake and voice themselves. Already some general impressions that the birds of certain species sang earlier than those of certain other species had been received, but it seemed to be worth while to obtain some exact records and learn whether there were definite and distinctive habits belonging to the common birds in regard to the time when they begin to sing. It was resolved, therefore, to procure a series of early morning records for comparison, and fifteen such records are now possessed, obtained on May 27 and June 2, 1902; June 8 and 28, 1903; June 11 and 16 and July 5 and 9, 1904; June 10, 1905; July 9, 1906; July 4, 1908; June 27, 1909; July 4, 1910; and June 28 and July 4, 1911. The range of date is nearly equidistant before and after the summer solstice. The variation in time of sunrise for thirteen of the records is but five minutes, the earliest sunrise, 4.02 o'clock, occurring midway within the dates of these thirteen records. The two other records extend to a variation of nine minutes in the time of sunrise. These variations affect but slightly the resulting averages of time derived from the series and have no effect to alter the relative places of the species in the order of their awakening. So they have been regarded as negligible. This period of the season was chosen, because it is the time when the birds in general are singing most freely and are definitely located for nesting.

That the first bird-note of the morning might be chronicled and assurance be had that the earliest had been heard, position has usually been taken fifteen or twenty minutes previous, as the experience of the first two or three occasions indicated the time to be. This has been done from 2.35 to 2.50 o'clock. The position

¹ Read before the Nuttall Ornithological Club, Cambridge, Mass., April 1, 1912.

taken on each occasion has been upon the driveway midway between the house and the road, or about fifty feet from either, with open lawn around. The record has usually extended over two or two and a half hours, that is, up to 5 or 5.15 o'clock.

The elevation of the location is about 1600 feet above the sea. The place is situated on the southwestern slope of Boy Mountain, which is a part of one of the secondary ranges and rises to a height of 2240 feet, the summit being somewhat north of east. The sunshine, therefore, is delayed in reaching the location and its immediate vicinity. The rays of the sun are seen on the mountains across the narrow valley some time before they have reached the listener's position, and still earlier they have brightened with rosy light the heads of the Presidents uplifted higher into the sky. Thus there is a pervasive light thrown around much before the birds whose voices have been chronicled come within the range of the sun, which is not until forty-five minutes or an hour after its actual rising.

A row of maples together with other shade trees borders the nearer roadside, while across the road, beyond a mere border of grass land, mixed woodland reaches up the mountain side. Farther eastward from this woodland is open, rocky, hillside pasture, dotted with individual spruces and firs. Mowing fields stretch away southeastward. Westward and about five hundred feet distant woods of mixed growth extend to the river which is some three hundred feet below in the valley bottom. These woods are well occupied by songsters, especially warblers of many species, whose songs are heard when at the close of the morning-awakening record the footpaths through them have been followed. But these voices within the wood have seldom reached up to the position chosen and entered the records obtained. The warblers and other songsters, however, which occupy the woodland bordering the road are well within the range of hearing, as well as the birds of the fields, the open hillside pasture, and the roadside.

Taking position with paper block in hand and assisted to make notes by the light of a small electric lantern or a candle, as the case may be, the first bird-note has been waited for. Meanwhile a few minutes of complete stillness have continued the silence of the night, this stillness being broken only by the distant sound of

the flowing river or by the occasional piping of a hyla or croaking of a frog in a pond-hole some distance away, and once by the voice of a Whip-poor-will coming up from the valley. A few fire-flies flitting about have often given a touch of animation to the foreground. Although at this time the darkness of night still prevails, the first glimmer of light has been apparent in the eastern sky even at 2.40 or 2.45 o'clock. This is soon followed by the first bird-notes, a Song Sparrow or a Chippy not far away breaking forth into its song once, or perhaps the song of an Alder Flycatcher in the middle distance once given, or the twitter of Barn Swallows at the nearest farm barn, or the sudden awakening and cackling of a Robin near by. Our neighbor's cocks also awake and crow at this time. The sparrows mentioned above at first give repetitions of their song at intervals only, two or three individuals of each species thus expressing themselves, but presently a Robin breaks forth into singing and continues with scarcely an interruption for about forty-five minutes, singing most joyously. The first Robin is soon joined by a second and a third and a fourth, their voices uniting in a loud and exuberant chorus. One Chipping Sparrow after another also joins in until three or four are singing, and these repeat their trills shortened from the usual length in a most hurried and excited way, seeming to be animated by a spirit of eager haste which is not manifested in their singing later in the day. Already one voice after another from several different species within range has joined in the concert. Meanwhile the pale light of the dawn has gradually brightened in the eastern sky and a faint light has begun to be diffused around. This is still quite dim at 3.15, but at 3.25 or 3.30 it has become sufficient to dispense with artificial light and begin to see by the light of day.

The birds remain on their night perches apparently until after 3.30 and commonly until 3.45 or 3.50, or even 4 o'clock. For the voices up to this time come from the same locations and the songs reach the ear unchanged in sound as to direction or distance. Moreover the light by 3.30 o'clock has become sufficient for discerning a bird if it were in motion. The earliest record of movement which has been noted, with one exception mentioned later under the Robin, was that of a Chipping Sparrow dropping from its perch in a maple by the gate to the driveway at 3.30 and con-

tinuing to sing there. On two other occasions, two years apart, a Chippy which had evidently spent the night in this maple by the gate dropped down onto the gate-post at 3.43 and 3.49 respectively. Barn Swallows have passed singing at 3.32 and 4 o'clock. A Robin was once seen to fly at 3.35 from one roadside maple to another. A Hummingbird once flew by at 3.52 and on another occasion was seen hovering among apple blossoms at 4 o'clock. The earliest Crow on the wing was seen at 3.53 and on another occasion at 4 o'clock. Two Cedar Waxwings once flew forth and about at 3.56 o'clock. The earliest Phoebe in flight dropped into the road at 4 o'clock. By 4.15, or directly after sunrise, there is general movement and activity. By that time most of the usual birds in the neighborhood have sung, and some have already finished their welcome to the day and are busily seeking their food.

On the fifteen occasions forty-six species which had spent the night near by have been recorded. Thirty-four of these were heard on many or several occasions, and twelve on one or two occasions only. The records of the latter class, however, are definite and, perhaps, of not inferior value. They represent species usually beyond the range of hearing yet on the single occasion or two located near. On three of the occasions nineteen or twenty species only contributed to the concert, but on five others twenty-nine or thirty different voices were heard.

Mornings that were calm and of about normal temperature were chosen. But twice the temperature was as low as 46° and 52° and once as high as 76°, namely, on the morning of July 4, 1911, a new maximum night record. Several mornings were clouded, however, the cloudiness increasing and two or three times culminating in rain a half-hour or so before the usual time of closing the record. Under these conditions some later voices naturally failed. Thus on July 4, 1910, a few drops of rain fell at 4 o'clock; at 4.23 there was a distant roll of thunder and a storm-cloud was seen to fill the western sky; at 4.35 it became very dark, and a few minutes later wind and rain had come. In ten minutes more the force of these had passed, but a gentle rain continued. Every voice had been stilled by the brief tempest, and when its noise had subsided not a note was heard. Five minutes later a Song Sparrow sang. Twenty species only had voiced themselves before the rain.

It does not appear that cloudy conditions have had an influence to any extent in delaying the time of early song. The records indicate that the early-singing sparrows and flycatchers, the Robin and other thrushes sang as early on some clouded mornings as on some fair mornings and in some instances even a few minutes earlier. Neither has the moon appeared to exert any influence, as it has usually been either the time of new moon, or a day or two before, or when it was in the first quarter, in all which phases there has been no moonlight at the time of morning-awakening. On four occasions when there was moonlight the sky was clouded, and the records indicate that the earliest singers were a trifle later in beginning to sing, the cloudiness offsetting whatever gain of light from the moon there may have been. It is a question, not answered by the records, whether bright moonlight influences the early songsters to sing earlier than when the sky is only starlit, since none of the records have been obtained under moonlight. It seems, however, not unlikely that bright moonlight has no effect to awaken earlier the early-singing birds, but that they instinctively await the first glimmer of daybreak before singing.

The combined records indicate that the birds of thirty-three species averaged to sing before the time of earliest sunrise, that being 4.02 o'clock. Included among these are nine members of the sparrow family, five of the common sparrows having place among the earliest eleven songsters; all six members of the thrush family from the Robin as the third bird to the Olive-backed Thrush as the seventeenth; the five common flycatchers, these having place among the earliest nineteen songsters; Black-billed Cuckoo, Ruby-throated Hummingbird, Crow, Barn Swallow, Red-eyed Vireo, Blue-headed Vireo, Chickadee; and six species of warblers, all which have place among the last sixteen of the thirty-three species which sing before sunrise. The Oven-bird, the earliest warbler, does not average to sing before 3.29 o'clock, or thirty-three minutes after the Song Sparrow and twenty-seven minutes after the Robin. The Redstart, the next earliest warbler, does not sing until seventeen minutes later. Then in the sixteen minutes preceding sunrise five other warblers begin to sing. Still five other species of warblers have not been heard until after the sun has risen. Perhaps in other locations some of the warbler voices would have been

earlier heard, but they have been listened for most carefully and have not been detected earlier than as recorded. The warblers, therefore, as a family appear to be comparatively late-awakening birds to sing. Most of the common sparrows and the flycatchers and all the thrushes precede them. The warblers also at the close of the day cease singing early, again the common sparrows and the flycatchers and the thrushes outdistancing them in extension of song, as in the morning by beginning earlier to sing. The Bobolink apparently waits for the sun to appear and then rises joyously on wing and pours forth his abundant song. The calls of the woodpeckers come after sunrise, and the voice of the Swift is then first heard.

The principle of averages which has been adopted for the record was suggested by the diversity of time of first song on the part of birds of many of the species, of which several records had been obtained. But if the relative order of species be based on the earliest singing of an individual upon any one occasion, still ten of the first eleven species in the list remain the ten earliest songsters, although the relative position in the case of several is somewhat changed. On this basis Song Sparrow remains first, having sung at 2.40; Chipping Sparrow remains second, at 2.45; Robin remains third, at 2.46; Barn Swallow becomes fourth, also at 2.46; Vesper Sparrow is fifth, at 2.47; Alder Flycatcher is sixth, at 2.53; Savannah Sparrow is seventh, at 2.54; Hermit Thrush is eighth, at 2.56; Phoebe is ninth, at 2.57; and Wood Pewee is tenth, at 2.58 o'clock. The White-throated Sparrow, sixth on the basis of averages, takes a lower place in the order, not having been heard earlier than 3.05 o'clock. Fractions of a minute resulting in deducing averages have been discarded. Where two or three species are recorded alike in time of awakening to sing, the fractions, smaller and greater, have determined the order of precedence. In instances, in which a time record or two of a species are considerably later than most records of the species and would tend erroneously to make the average time of first song somewhat later, these records have been eliminated in the reckonings, with the sole purpose of obtaining results most closely in accordance with the facts.

The author would desire it to be understood that, while he has endeavored to be accurate, he regards the figures of time given as

close approximations to the true rather than as absolutely exact. And it should also be understood that the entire paper is the result of the author's records and individual experience in this mountain hamlet.

The order of awakening follows in detail. It should be borne in mind that the time of the earliest sunrise within the period of the season covered is 4.02 o'clock.

1. The SONG SPARROW (*Melospiza melodia melodia*) breaks forth into song in an occasional way first of all the birds, much as it has sometimes been heard to do in the hours of the night, giving, it may be, a single rendering or two only. A second and a third bird usually promptly follow the first, also singing in this occasional way, and thereby differentiating this singing from the casual expression of song of a single bird in the night hours. The earliest recorded time of song is 2.40 o'clock. On six other occasions the times of first song have been 2.47, 2.52, 2.54 (twice), 2.56, and 2.59 o'clock. On four occasions the first song was at 3 and on one other at 3.10 o'clock. This occasional singing at intervals often continues for forty-five minutes, and then the songsters give themselves over to song for a period, their voices becoming more prominent in the morning chorus. The records of these twelve occasions establish the average time of the first song as 2.56 o'clock. The average time of more free and constant singing is 3.36 o'clock. The very infrequent repetition of the song for the first forty-five minutes, or thereabouts, constitutes the Song Sparrow an inconspicuous first songster, while it really is the earliest in point of time, based upon averages of records.

2. The CHIPPING SPARROW's (*Spizella passerina passerina*), earliest record for song is 2.45 o'clock. There are twelve records of first song between 2.45 and 3.15 o'clock. These establish the average time as 2.58 o'clock. As in the case of the Song Sparrow, the Chippy gives its trill, it may be, a single utterance or two only, and other repetitions may not come for some minutes; then another considerable pause may follow. But the second, third, and usually a fourth bird without much delay awakening to sing in this occasional manner, the singing must be regarded as the expression of morning song and be distinguished from the casual utterance of a single bird in the hours of the night, which is of a transient

and capricious character. This occasional singing often continues for fifteen or twenty minutes, while the birds are fully waking up; and then the several songsters begin to sing very rapidly, repeating their trills with precipitate haste and almost without pauses. I have never heard a Chippy sing in this manner at any other time of day. This rapidly repeated trilling is continued for a while, and then the birds, having apparently expended their surplus of energy, drop into their usual way of singing and continue indefinitely.

3. The ROBIN (*Planesticus migratorius migratorius*) comes third in the order of the awakening. Three or four singing birds are usually within near range. The earliest record of the song has been 2.46, when on June 27, 1909, a bird began to sing without previously calling, followed by a second bird in song two minutes later, and by a third bird singing three minutes later still. Often the Robin gives calls a few minutes before breaking into song. The average time of first song based on twelve records is 3.02, the time ranging from 2.46, 2.53 and 2.54 to 3.10 and 3.12 o'clock. The birds with little variation continue to sing lustily and joyously for forty-five to fifty minutes. Then there is a pause of some length during which scarcely a robin song is heard, and within the hour following the first period of free singing only occasionally is the song given and only for a brief time usually. The period of exuberant singing is from 3.00 or 3.10 to 3.45 or 3.50 o'clock. Before 4 o'clock, therefore, the Robins have poured forth their ecstasy of song, not to be equalled again during the day, howbeit, one and another may indulge in periods of singing at almost any hour. All sing together at the early hour named and with the joyousness and freshness of spirit which daybreak inspires.

On July 4, 1911, the father of a brood, snugly in their nest among the woodbine clambering on the front of the house, wakened on his night perch in a maple by the roadside at 2.50 and suddenly gave a few loud calls. After a minute or two, with solicitous thought of his family, it was evident, he flew to the end of the ridge-pole, and stationing himself, quietly for a moment, at 2.53 broke forth in calls again, and these were immediately followed by song much more softly voiced than usual and continued a briefer time. This short flight constitutes the earliest bird-movement on the wing which I have discerned.

The lusty character of the Robin's song from the time of its beginning throughout its first forty-five minutes' period of singing constitutes it the conspicuous early singer and makes it appear to be the earliest singer of all, whereas the Song Sparrow and the Chipping Sparrow both precede the Robin in a few earlier expressions of song. These, however, are later than the Robin in giving themselves over to singing and in attaining the full spirit of exuberance which the Robin attains at once upon beginning to sing.

4. The ALDER FLYCATCHER (*Empidonax traillii alnorum*) was once heard to sing as early as 2.09, repeating the song at 2.23 and again at 2.35, on June 16, 1904. On another occasion a bird sang at 2.18 twice and at 2.29 again. These, doubtless, should be regarded as utterances in the night, such as the Song and the Chipping Sparrow and the Oven-bird have sometimes been heard to make. These birds began to sing in the usual way with repetitions after short pauses at 2.53 and 2.54 respectively. Ten records furnish the average time of 3.03 for the first singing, the range having been from 2.47, 2.53 and 2.54 to 3.15 (twice). The song is often continued thirty or forty minutes, but sometimes is lost to the ear much sooner. Frequently two birds have been within the range of hearing, the second beginning to sing soon after the first.

5. BARN SWALLOW (*Hirundo erythrogastra*). The twitter of a colony at a neighboring farm barn has been one of the earliest sounds. It is steadily maintained and seems to proceed at first from the birds on their night perches. The earliest record is 2.46 on July 9, 1906. Other earliest records are 2.51 and 2.59 (twice). The average time based on eleven records is 3.04 o'clock. A little later the song comes from the air as the birds circle in flight,—once even as early as 3.32,—when the light is still quite dim and scarcely any other birds have left their night perches.

6. The WHITE-THROATED SPARROW (*Zonotrichia albicollis*) is not located within hearing on the Highland, but is a regular summer resident of the valley. Only occasionally at any hour has its voice been heard at the house or in the yard. But on June 27, 1909, at 3.06 the song came up distinctly to the ear and was recorded. On one other occasion, June 23 of the same year, when I was at Cherry Pond for the night, the song was first heard at 3.05 in the morning from a bird near at hand.

7. The WOOD PEWEE'S (*Myiochanes virens*) voice has not always been within hearing. Eight records give the average time of its first song as 3.06 o'clock. The earliest record has been 2.58 and the latest 3.12 o'clock. A single singer only usually joins in the concert, and his plaintive song has reached the ear in an occasional way.

8. The VESPER SPARROW (*Poæcetes gramineus gramineus*) also comes into the group of birds which sometimes sing before 3 o'clock. The earliest occasion was at 2.49; the next earliest at 2.58 o'clock. The average time of beginning to sing, based on nine records, is 3.07 o'clock. Sometimes two birds have been within hearing. The singing is continued commonly for forty-five minutes or an hour without long pauses.

9. The HERMIT THRUSH (*Hylocichla guttata pallasi*) invariably calls for a few minutes before breaking into song. When a bird has been located near, the calls have always been first noted; but when the birds are more distant, the song comes as the first voicing heard. Therefore the species has been assigned its place on the basis of the time of its beginning to sing. Three or four singing birds have sometimes been within the range of hearing. The average time of the first call heard, based on ten records, has been 3.06 o'clock. The earliest records are 2.56 and 2.59 o'clock. The average time of the first singing is 3.11, or five minutes later than the first call. The song is always continued in the beautiful, calm manner characteristic of the species, first in one of the three registers and then in another with endless variety of change, quite indefinitely; with pauses, to be sure, but it is likely to be heard much of the day, even at noon. At Cherry Pond the first singing of a Hermit Thrush in the morning was at 3.10 o'clock.

10. PHÆBE (*Sayornis phæbe*). The usual time of awakening places the Phæbe tenth among the earliest birds. Ten records furnish the average time of 3.11, when the song has first been heard. The earliest awakenings have been 2.57 and 3.05 o'clock. The song is usually continued without much pause for an hour or more. On June 11, 1904, a near bird broke out demonstratively at 3.10, contributing the Phæbe song of the morning.

11. SAVANNAH SPARROW (*Passerculus sandwichensis savanna*). The light voice of this bird is sometimes not near enough to be

heard, and it is also lost at times when the music of the morning becomes *fortissimo*. Based on seven records, the average time of the first song is 3.12 o'clock. The earliest awakening was at 2.54 on June 10, 1905, when the song was given once, followed by another rendering at 3.00, another at 3.07, and the next at 3.15, after which the song was constant with brief pauses only. The average time of getting into constant singing is 3.27 o'clock. One bird only is usually within hearing.

12. The VEERY (*Hylocichla fuscescens fuscescens*) is usually located too remotely to be heard among the near songsters. Toward the end of the recording the voice of one has been heard on three occasions, either calling or singing, some distance below, namely, at 4.40 and 5.00 (twice). But after the night at Cherry Pond, in the haunt of the Veery the song was heard at 3.13 in the morning from one bird, soon followed by three others. This record, which plainly should take precedence, places the Veery near the Hermit Thrush in the time of its beginning to sing.

13. The BLACK-BILLED CUCKOO (*Coccyzus erythrophthalmus*) has twice been heard at 4.15 and 4.29 respectively. On a third occasion, when I was at Cherry Pond, one began to call at 3.20 in the morning. This record, obtained in the haunt of the Cuckoo, should give the species its relative place, as the later records undoubtedly were not the first morning voicings of the birds.

14. The KINGBIRD (*Tyrannus tyrannus*) has been located but once within the range of hearing. On July 4, 1908, at 3.22 one was heard. On the occasion of my spending the night at Cherry Pond a bird was first heard at 3.24 in the morning. These two records furnish an average time of 3.23; although it is not improbable that if other records had been obtained, the Kingbird might rank somewhat earlier in the list.

15. The BLUEBIRD (*Sialia sialis sialis*), has been located several seasons beyond the range of hearing. Four records furnish an average of 3.25 as the time of first singing. The variation is small, namely, 3.20, 3.24, 3.27, and 3.30 o'clock. The call was heard on one occasion at 3.15 o'clock. Usually the song is continued but a few minutes, five to twenty, when the bird passes out of hearing or becomes silent. But on July 9, 1904, one beginning to sing at 3.20 continued its song most joyously and steadily until

4.30, so that the record states "Have never before heard so much bluebird song in an hour; the singing is almost as loud as a robin's."

16. The WOOD THRUSH (*Hylocichla mustelina*), as yet a rare bird in Jefferson, in three seasons has been located well within hearing, namely in 1904, 1905, and 1908. Five records have been made, three having been obtained in 1904. The earliest singing was at 3.25 on June 16, 1904. On June 11, 1904, and June 10, 1905, the song first reached the ear at 3.26 on both occasions. On July 5, 1904, and July 4, 1908, it was first heard at 3.38 o'clock. On the earliest occasion the bird continued its song for thirty minutes without much change of location and then moved farther up the mountain side and was heard at intervals for another thirty minutes. Upon the next two earliest occasions the song was heard for five or ten minutes only, when the bird probably moved out of hearing. On the fourth and fifth occasions, when one was first heard at 3.38, the voice was well back in the woodland on the mountain side and twenty minutes later had come much nearer. Not unlikely the bird at each of these times had been singing earlier. The relative position of the Wood Thrush, therefore, would seem to be properly based on the three earlier records, when the songster from the beginning was located near. The average time of first song will then be 3.26 o'clock. The voice has always been in association with the Hermit Thrush's and sometimes also with that of the Olive-backed Thrush.

17. The OLIVE-BACKED THRUSH (*Hylocichla ustulata swainsoni*), while an abundant bird in all woodland, has been favorably located for hearing its first song on three occasions only, the listener's position being in the open, while the Olive-back is commonly too far within the wood, both in front and rear, for its voice to be readily heard. The average time of its first song on these occasions was 3.27, the three records being 3.21, 3.26 and 3.35 o'clock. On two of these occasions the songster continued to sing with only slight interruptions up to 5 o'clock, when the record was closed. So the voice was recorded as the most regular and constant among the voices of the morning.

18. The OVEN-BIRD (*Seiurus aurocapillus*) is the earliest of the warblers to voice itself. Like the Song Sparrow and the Chipping

Sparrow it occasionally breaks forth in the night, giving a song which is after the manner of its flight song, although the bird at so early an hour may not leave its perch. On June 27, 1909, one burst forth in such a song at 2.12 and was again heard at 2.57, while it was 3.43 when it began to sing in its usual way. Eleven records give the average time of first song as 3.29, the earliest records, eliminating night utterances, having been 3.09, 3.12, and 3.17, and the latest 3.41 and 3.43 o'clock. Two birds have often been heard.

19. The LEAST FLYCATCHER (*Empidonax minimus*), while located both higher and lower on the mountain side, has been but once within the range of hearing. On June 28, 1911, the song from one located near was heard at 3.30, and the bird continued to sing up to 5 o'clock or later. It is not improbable that if more records had been obtained, the Chebec might rank higher in the order, as do the other common flycatchers.

20. The FIELD SPARROW (*Spizella pusilla pusilla*), is a rare bird in Jefferson. But one was temporarily located in 1911 on the mountain side, and its voice entered the morning-awakening record on July 4 at 4.06 o'clock. It had undoubtedly been singing earlier, and the voice had not reached the ear. At 4.24 the song was heard much more plainly. On June 19, 1908, a Field Sparrow had been heard singing eight or ten times beginning at 3.30, before I rose, and was still singing in the neighborhood at 5.15 o'clock. This earlier record places the Field Sparrow among the other sparrows, which as a family are early singers.

21. SLATE-COLORED JUNCO (*Junco hyemalis hyemalis*). The range of record of the Junco's first singing is rather wide, extending from 2.55 and 2.58, when the song was heard only once or twice on two occasions, to 3.49, 3.50 and 3.51 on three other occasions. The average time based on thirteen records is 3.31 o'clock. The song is often continued for more than an hour. Usually one bird only has been within hearing.

22. The CHICKADEE'S (*Penthestes atricapillus atricapillus*) song has been heard on six occasions, namely, at 3.30, 3.43 (twice), 3.45 (twice), and 3.50 o'clock. The average time has been 3.43 o'clock. On May 27, 1902, one beginning to sing at 3.43 continued his song for some time.

23. RED-EYED VIREO (*Vireosylva olivacea*). The song being of a quiet and monotonous character and as such not appealing strongly to the ear, at least such is the recorder's usual experience, particular pains have been taken to note the time of beginning of its song and not allow it to pass unnoticed. Four or five birds are usually within the range of hearing. As 3.33 is the earliest time recorded, the species does not awake early to sing. And the range of time of first song which thirteen records furnish indicates a small variation only, as the latest time recorded is 3.53 o'clock. On four occasions it has been between 3.33 and 3.39 and on nine other occasions between 3.41 and 3.53 o'clock. The average time of the thirteen records is 3.43 o'clock. Sometimes the phrase of the song is repeated quite rapidly for a few minutes at the time of beginning. Usually the birds continue to sing without much pause for thirty or forty minutes or even an hour, and then, as is well known, with short rests most of the day.

24. The CROW (*Corvus brachyrhynchos brachyrhynchos*) is a comparatively late riser, as it ranks twenty-fourth among the common birds in the time of voicing itself. While it is not the twenty-fourth bird on any one occasion, since all its predecessors which have been named in order do not appear in the chorus on any one morning, it has always been the twelfth bird or later in the succession of the awakening. Fourteen records show that the earliest times at which a Crow has been heard to call were 3.35 and 3.36 o'clock. On the former occasion Chipping Sparrow, Robin, Alder Flycatcher, and Vesper Sparrow had sung at 2.45, 2.46, 2.47 and 2.49 respectively. The average time of the first call is 3.44, or not until after the Robin has sung for forty-five minutes or even an hour and from eleven to sixteen species have already voiced themselves. The range in time is narrow, since the latest is 3.56 o'clock. The variation, therefore, in the Crow's awakening is only twenty-one minutes on the fourteen occasions ranging in date from May 27 to July 9 and covering ten seasons. If the latest-time record were eliminated, the latest remaining would be 3.52, and the variation for thirteen records would be but seventeen minutes, constituting the Crow one of the most regular of the common birds. A single bird is usually first heard located somewhere upon the mountain side, and later two birds often appear in flight. The Crow was

earliest seen in flight on one occasion at 3.47 o'clock, when two passed silently overhead. On one other occasion a single bird was seen on the wing at 4 o'clock.

25. REDSTART (*Setophaga ruticilla*). If the Oven-bird be excepted, the Redstart introduces the warbler singing. All warbler song is delayed on the average until 3.29, when the Oven-bird begins to sing. The Redstart, based on ten records, averages to sing seventeen minutes later, or at 3.46 o'clock. It has been heard once as early as 3.26, but on three other occasions was first heard at 3.55, 3.56 and 3.58 respectively. Two and sometimes three birds sing within hearing. On June 28, 1911, the first bird began to sing at 3.41, the second was heard at 3.49, the third at 3.52, and the three continued singing much of the time up to 5.15 o'clock.

26. The INDIGO BUNTING'S (*Passerina cyanea*) position in the list is based on six records. In some of the years no bird has been within hearing, although year by year several have been located in the neighborhood. In the seasons of record two and sometimes three birds have sung. The six records give the average time of first song as 3.51, and they vary but little, being 3.45, 3.50, 3.51 (twice), 3.54 and 3.58 o'clock. The birds after beginning to sing continue most persistently, for while there may be occasional pauses, yet the song is heard much throughout the day.

27. MARYLAND YELLOW-THROAT (*Geothlypis trichas trichas*). The first song, based on five occasions, when a bird was located near, averages to come at 3.51, the time ranging from 3.41 to 3.50, 3.53 and 3.55 (twice). The flight song in the night has sometimes been heard.

28. The BLACK-THROATED BLUE WARBLER (*Dendroica caerulescens caerulescens*) was heard on one occasion at 3.52, the bird being located near at hand. It is unusual for this warbler to be heard unless the listener goes within the woodland.

29. The BLUE-HEADED VIREO (*Lanivireo solitarius solitarius*) has been within hearing but once on these occasions. At other times and seasons its voice has been much heard near the roadside or from the wood borders, but at the season the records have been made the voices have been too much within the woodland and too far away on the mountain side to be heard. But on July 4, 1908,

at 3.52 one sang beside the road in the foreground. As the Red-eyes do not average to sing before 3.43, quite likely this single record is fairly representative.

30. The NASHVILLE WARBLER (*Vermivora rubricapilla rubricapilla*) has been heard but twice, namely, at 3.50 and 3.56 o'clock. The nesting haunts of the species on the Highland are usually beyond the range of hearing. The time of first song based on the two records obtained, when a bird was located sufficiently near, is 3.53 o'clock.

31. The MAGNOLIA WARBLER (*Dendroica magnolia*) has been heard on seven occasions, the time of the first song varying from 3.42 (twice) and 3.47 to 4.09 (twice). The average time is 3.55 o'clock. On the two other occasions the first song heard was at 3.58 and 3.59 o'clock. A single bird only is usually within the range of hearing and is sometimes heard at intervals for twenty or thirty minutes or even an hour.

32. GOLDFINCH (*Astragalinus tristis tristis*). The first call, as based on eleven records, averages at 3.58 o'clock, the time ranging from 3.49, 3.50 (twice), 3.52 and 3.54 to 4.10 and 4.18 o'clock. Calls have invariably constituted the earliest records, and later by some minutes the song has been heard, if given at all; for in June and early July the joyous outpouring of song on the wing is not as much given as somewhat later in the season.

33. The BLACK AND WHITE WARBLER (*Mniotilta varia*) has been heard on one occasion only, namely, at 4.04 o'clock.

34. PURPLE FINCH (*Carpodacus purpureus purpureus*). The relative position is based on ten records which range from 3.18, 3.37 and 3.43 to 4.40 and 4.46 and furnish an average of 4.05 as the time of its first voicing. On several occasions a bird has sung. At other times the call-note only has been heard either from one in flight or from several feeding in a near Juneberry tree (*Amelanchier canadensis*), which were giving little thought to song, while they eagerly feasted on the small fruit. In this tree on July 4, 1908, at 4 o'clock one sang while several were engaged in feeding. On another occasion two were seen in this tree silently eating the fruit at 4.20, which had given neither call nor song that had been heard and were apparently absorbed in first satisfying their hunger.

35. The BLACKBURNIAN WARBLER (*Dendroica fusca*) has fur-

nished five records, when one has been located favorably within hearing. The time of first song has ranged from 3.40 to 4.17, but on the three other occasions was earliest heard at 4.05, 4.10 and 4.11 respectively. The average time is 4.05 o'clock.

36. The BOBOLINK'S (*Dolichonyx oryzivorus*) time of first singing is based on nine records, ranging from 3.59 twice, 4.01 and 4.03 to 4.21 (twice) and 4.22, the average time being 4.10 o'clock. On June 11, 1904, it was precisely 4.10 when one first poured forth on the wing his song of ecstasy.

37. The YELLOW-BELLIED SAPSUCKER (*Sphyrapicus varius varius*) has been heard to call and drum on three occasions, the first sounds coming at 3.51, 4.10 and 4.30 respectively. The drumming is done upon telephone posts at the roadside. The calls usually come when the bird is at work upon birches or apple-trees. The average time of making its presence known has been 4.10 o'clock.

38. CHIMNEY SWIFT (*Chætura pelagica*). As it passes in rapid flight through the air, the Swift's voice has been recorded on ten occasions, ranging in time from 3.58 and 4.00 to 4.24, and averaging 4.10 as the time of its appearance on the wing from its night's rest in the chimney. Thus the Swift appears only two or three minutes before sunrise at the earliest and usually delays until a few minutes after.

39. The BLACK-THROATED GREEN WARBLER (*Dendroica virens*) furnishes three records when one has been located within hearing. Usually the voices of the two or three birds in near woodland are not heard until one has gone within the woods. The time of first song heard on these three occasions has been 3.56, 4.17 and 4.26, which give an average time of 4.13 o'clock.

40. NORTHERN PILEATED WOODPECKER (*Phlæotomus pileatus abieticola*). There are eight records, when a bird has been heard loudly rapping in the distance with slow and measured blows or has called lustily and long, sometimes answered by another. The times of first hearings range from 3.46 and 3.55 to 4.39 and 4.48 and average 4.16 o'clock. Both the calls and the rappings are so loud that they cannot easily be overlooked even if the bird or birds be a half-mile distant either in the valley or on the mountain side.

41. CEDAR WAXWINGS (*Bombycilla cedrorum*) have made known their presence by their soft sibilant calls on seven occasions, the

time ranging from 3.56, 4.04 and 4.05 to 4.40 o'clock. On three occasions the records are 4.31 and 4.32 (twice). The average time when the birds were first heard has been 4.20 o'clock.

42. NORTHERN PARULA WARBLER (*Compsothlypis americana usneæ*). The time of first singing is based on a single record, when the song was heard at 4.22 o'clock. The birds of the species with this single exception have been out of the range of hearing within the lower woodland.

43. The MYRTLE WARBLER (*Dendroica coronata*) has been within hearing on three occasions and has been first heard at 4.20, 4.26 and 4.30 respectively. The average time is 4.25 o'clock. In most seasons the small representation of the species in the immediate vicinity is located too far away to be heard from the listener's position.

44. The CHESTNUT-SIDED WARBLER (*Dendroica pensylvanica*) has sung on four occasions. At other times the species has been located too remotely to be heard. The four records furnish an average time of first song as 4.37, the earliest singing heard having been at 4.21 o'clock.

45. The DOWNY WOODPECKER (*Dryobates pubescens medianus*) furnishes seven records, when a bird or two birds have given either the single call-note or the long roll-call. The time has ranged from 4.17 to 5.00 and averages to have been at 4.43 o'clock.

46. The CANADA RUFFED GROUSE (*Bonasa umbellus togata*) was twice heard drumming in late May, 1902, at 5.10 o'clock on both occasions.

Other species entered into the records made, but as the birds apparently had not spent the night close by, but came within hearing in an adventitious way, they will simply be named and the time given when they were first heard: Whip-poor-will, 2.45; Nighthawk, 3.15; Ruby-throated Hummingbird, 3.52; Crossbill, 3.58; Crested Flycatcher, 4.00; Cliff Swallow, 4.08; Pine Siskin, 4.14; Scarlet Tanager, 4.15; Winter Wren, 4.15; Blue Jay, 4.21; Rose-breasted Grosbeak, 4.30; White-winged Crossbill, 4.30; White-breasted Nuthatch, 4.30; Tree Swallow, 4.40; Northern Flicker, 4.40; Mourning Warbler, 4.45; Prairie Horned Lark, 4.53; Canada Warbler, 5.00; Red-breasted Nuthatch, 5.00; Belted Kingfisher, 5.10; Olive-sided Flycatcher, 5.20 o'clock.

Several records at the end of the day have also been taken, but these are much more limited as to the number and variety of the voices participating than in the morning awakenings. By these records twenty-six species have been heard between 7 and 8.20, when the time of sunset was about 7.30 o'clock. Only three species of warblers have been heard to sing within this period and their last songs been recorded, namely, Redstart at 7.38, Magnolia at 7.40 and Oven-bird at 7.49, in each case the song being about as long after sunset as in the morning their respective earliest songs were before sunrise. An Oven-bird on one occasion gave its flight song at 7.28 o'clock. The Bobolink's last burst of song was at 7.20, or just before the time of sunsetting, as in the morning his first joyous song on the wing is at sunrise. The Indigo Bunting ceased singing about 7.23, or seven minutes before sunset. His morning record is ten minutes before sunrise. The Crow's last call came at 7.26 o'clock. The Goldfinch and the Purple Finch ceased at 7.25 and 7.35 respectively. They both enter the morning record a few minutes only before and after sunrise. The Crested Flycatcher was not heard to call after 7.27 o'clock. Chimney Swifts last scurried round in hurried flight giving their bubbling outpouring of notes at 7.28, two minutes before sunset; their morning record is eight minutes after sunrise. A White-throated Sparrow's voice from the valley was lost at 7.45, and a Field Sparrow's from the hillside at 7.48 o'clock. Three common flycatchers ceased to sing at about the same time, the Least at 7.44, Phoebe at 7.47, and the Wood Pewee at 7.50 o'clock. The latest twitter from Barn Swallows came at 7.54 o'clock. The last songs from Chipping Sparrow, Savannah Sparrow, and Song Sparrow were at 7.52, 7.55, and 7.57 respectively. All the five thrushes, Wood, Veery, Olive-backed, Hermit and Robin, were the latest of all the birds to voice themselves, with the exception of the Vesper Sparrow and the Alder Flycatcher, which were also among these latest singers. The Wood Thrush was last heard to call at 7.53 and again at 7.58 o'clock. The Veery sang up to 8 o'clock; two Olive-backed Thrushes to 8.02, and one to 8.05 o'clock. The Vesper Sparrow continued to sing to 8.07; and the Alder Flycatcher sang twice at 8.15 and 8.16, when his voice was hushed. The Hermit Thrush after a period of continuous singing gave his last

call at 8.17, and the Robin sang his last notes at 8.18 o'clock. The Robin and the Hermit are always close rivals as to which shall sound the last note. After an interval of two or three minutes, when neither has voiced itself, one or the other will again render a phrase of song or give a few calls. Calls are usually the last notes heard. The Robin generally triumphs by a minute or two. Then all the voices are hushed for the night, except that a Song Sparrow or a Chippy may break forth sleepily to give its song once even an hour later, as they sometimes do in the night before beginning their morning singing.

The same species, therefore, which sing earliest at daybreak also sing latest at twilight, and they cease singing, generally speaking, in a reversed order, although there are some variations in the order. These earliest and latest singing species are the common sparrows, namely, Vesper, Savannah, White-throated, Chipping, Field, Junco, and Song; the common flycatchers, Kingbird, Phoebe, Wood Pewee, Alder, and Least; and the thrushes, Wood, Veery, Olive-backed, Hermit, Robin, and Bluebird. Other species which awake to voice themselves but little before sunrise or after, cease to sing and call at sunset or a little later. Such are the Chimney Swift, the Crow, the Bobolink, the Purple Finch, the Goldfinch, the Indigo Bunting, the Cedar Waxwing, the Red-eyed Vireo, the Blue-headed Vireo, and the warblers in general. Habit in this respect seems to be adhered to as a law of the various species' being, from which they scarcely deviate. So not any of the earliest songsters of the morning cease to sing in the evening until some time after sunset, and several continue for almost an hour later. And on the other hand there are no species which awaken to sing late in the morning which continue to sing late in the evening. Those of the first group seem not to be dependent upon daylight for inspiration, but voice themselves in song in comparative darkness, while the others do seem to be dependent upon daylight and are silent except it be comparatively light.

Even-song is not extended as long after sunset as matins precede sunrise, since the earliest songs of ten species in the morning are given from an hour and five to twenty minutes before sunrising, while the latest ten songsters in the evening continue to sing only from twenty-four to forty-eight minutes after sunset. This

must be because even the birds grow weary by activity and become drowsy with overpowering sleep after the sun is withdrawn and even while a deep glow remains in the western sky delaying the darkness of night, while in the morning, refreshed by the night's sleep, these songsters respond to the first glimmer of dawn in the east by awakening to sing before any perceptible light has been diffused around, reinvigorated, buoyant, eager for the activities and joys of the new day.

OCTOBER BIRDS OF THE HEADWATERS OF THE GILA RIVER, NEW MEXICO.

BY W. H. BERGTOLD, M. D.

THE area in which the following records were made extends about forty-two miles east and west, and about thirty miles north and south: it is bounded on the east by the Black Range, which forms the continental divide, and too, the watershed between the Gila and the Rio Grande: on the south it is bounded by the Pinos Altos Mountains and their spurs, while to the north the area emerges in a mesa formation which, extending northward, terminates in the San Augustine Plains.

The Gila arises in this area from converging tributaries, runs westerly and leaves it near the southwest corner. As a whole, it is a wild and beautiful country, very sparsely settled, traversed by many streams, several of which are living throughout the entire year, and have eroded deep and picturesque canyons through which they now flow. Along these river bottoms, especially the main Gila, its three forks, Black Canyon, and Big Turkey Creek, there is a striking growth of cottonwood, sycamore, alder, walnut, boxelder, and ash, these trees being covered in many localities, by an abundance of wild grape and clematis vines, a growth which in the fall helps to paint a landscape of splendid color and striking effect.